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EXAMINER	
COUGHLAN, PETER D	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/825,032	HAUDRICH ET AL.	
	Examiner	Art Unit	
	Peter Coughlan	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

Detailed Action

1. Claims 1-30 are pending in this application.

Disclosure Objection

2. Claims 6, 13, 16, 19 and 27 have the terms 'scalar bias value', 'bias value', bias module', 'store loading' and 'maximum weight'. For consideration of these claims the applicant is required to amend the drawings and specifications to describe claimed subject matter.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 14, 15, 21, 22, 28, 29, 30 are rejected under 35 U.S.C. 102(b) (hereinafter referred to as **Spencer**) being anticipated by Spencer, 'Adaptive nonlinear neural network controller for rotorcraft vibration'.

Claim 1.

Spencer anticipates an input module configured to receive one or more input parameters associated with aeroelastic characteristics of a structure (**Spencer,** p539:8-18); and a neural network module coupled to the input module, and configured to generate a transformation of the one or more input parameters to produce at least one aeroelastic analysis result, the transformation based in part on a trained neural network. (**Spencer,** abstract)

Claim 2.

Spencer anticipates an output module coupled to the neural network module (**Spencer,** p543:14 through p544:5; 'Output module' of applicant is equivalent to 'two output channels' of Spencer.), and configured to output the at least one aeroelastic analysis result. (**Spencer,** p543:14 through p544:5; ' Aeroelastic analysis result' of applicant is equivalent to 'control the beam of Spencer.)

Claim 5.

Spencer anticipates the one or more input parameters comprise: a weight (**Spencer,** abstract; 'Weight' of applicant is equivalent to 'mass' of Spencer.); and a location of the weight on the structure. (**Spencer,** p539:35-41)

Claim 14.

Spencer anticipates an input module configured to receive a weight and a location of the weight on a structure (**Spencer,** p539:8-18 and 35-41); and a

neural network module coupled to the input module and configured to provide the weight and location as inputs to a trained neural network having at least two neurons to determine a flutter speed and an associated flutter frequency based in part on the weight and location. (**Spencer,** p538:14 through p539:28; 'Flutter speed' and 'flutter frequency' of applicant is equivalent to 'rotational speed (Ω)' and dominant frequency (NΩ).)

Claim 15.

Spencer anticipates the location of the weight is selected from a predetermined number of locations on a structural model. (**Spencer,** p539: 35-41; The 'number of locations' of applicant is equivalent to 'location of each fictitious joint' of Spencer.)

Claim 21.

Spencer anticipates receiving at least one input parameter related to an aircraft structure (**Spencer,** p539:8-18); applying a predetermined neural network transfer function to the at least one input parameter to generate an aeroelastic analysis result (**Spencer,** abstract; 'Vibrations' would be the input and the output of the aeroelastic analysis would be for the 'structure actuators'); and outputting the result.(**Spencer,** abstract; The outputted results control the structure actuators.)

Claim 22.

Spencer anticipates and receiving a weight (**Spencer,** abstract); and receiving location of the weight on the aircraft structure. (**Spencer,** p539: 35-41).

Claim 28.

Spencer anticipates receiving at least one input parameter related to an aircraft structure (**Spencer,** p539:8-18); applying a predetermined neural network transfer function to the at least one input parameter to generate an aeroelastic analysis result (**Spencer,** abstract; 'Vibrations' would be the input and the output of the aeroelastic analysis would be for the 'structure actuators')t; and outputting the result. (**Spencer,** abstract; The outputted results control the structure actuators.)

Claim 30.

Spencer anticipates means for receiving input parameters (**Spencer,** p539:8-18); means for applying a neural network transfer function to the input parameters to generate an aeroelastic analysis result; (**Spencer,** Input parameters would be mass and stiffness.) and means for outputting the result. (**Spencer,** abstract; The outputted results control the structure actuators.)

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 17, 18, 19, 20 are rejected under 35 U.S.C. 102(b) (hereinafter referred to as **Natarajan**) being anticipated by Natarajan, 'Aeroelasticity of Morphing Wings Using Neural Networks'.

Claim 17.

Natarajan anticipates determining a training set of characteristic I/O pairs (**Natarajan,** p59 through p64; 'Characteristic I/O pairs' of applicant is equivalent to 'resilient back-propagation training routine' of Natarajan.); generating a neural network (**Natarajan,** p56-59); training the neural network using the training set to generate a trained neural network (**Natarajan,** p59 through p64; When convergence is obtained then training is complete.); and determining aeroelastic characteristics of a structure based in part on the trained neural network. (**Natarajan,** abstract)

Claim 18.

Natarajan anticipates determining an accuracy of the aeroelastic characteristics determined using the trained neural network. (**Natarajan,** p60:16 through p61:5)

Claim 19.

Natarajan anticipates determining a weight vector in the trained neural network (**Natarajan,** p53:9 and p55:2-4) ; and determining a bias value in the trained neural network. (**Natarajan,** p79:13-17)

Claim 20.

Natarajan anticipates determining the aeroelastic characteristics comprises: multiplying received input parameters by the weight vector to generate weighted parameters (**Nartarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing the weighted parameters and the bias value to generate a summed input (**Natarajan,** p54 Figure 3.1, Input and weight go into biases 'b' and 'c'); and applying the summed input to a transfer function associated with a neuron in the trained neural network. (**Natarajan,** p53:10 through p54:8)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer as set forth above in view of Eberhart (U. S. Patent Publication 20030191406, referred to as **Eberhart**)

Claim 3.

Spencer fails to particularly call for the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

Eberhart teaches the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial. (**Eberhart,** ¶0102) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using a standard keyboard for data input as taught by Eberhart to have the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

For the purpose of using an industry standard keyboard for data entry would promote accuracy.

Claim 4.

Spencer fails to particularly call for the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

Eberhart teaches the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector. (**Eberhart,** 0045) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using an electrical connector for data transmission as taught by Eberhart to have the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

For the purpose of having a direct connection for secure and reliable data transfer into the neural network.

Claim Rejections - 35 USC § 103

6. Claims 6, 7, 8, 9, 10, 13, 16, 23, 25, 27, 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer as set forth above in view of

Natarajan ('Aeroelasticity of Morphing Wings Using Neural Networks', referred to as **Natarajan**)

Claim 6.

Spencer anticipates wherein the neural network module comprises: a weight vector module configured to multiply the one or more input parameters by a weighting vector to generate one or more weighted parameters. (**Spencer,** abstract; Stiffness and mass are two input parameters.)

Spencer fails to particularly call for a bias module configured to provide a scalar bias value; a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

Natarajan teaches a bias module configured to provide a scalar bias value (**Natarajan,** p54, Figure 3.1, 'b' and 'c' are neutron bias modules.); a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value (**Natarajan,** p54, Figure 3.1; 'b1', 'b2' and 'b4' all take in multiple weights and input parameters and output multiple weighted results); and a transfer function module coupled to the summer and configured to apply a transfer function to the sum. (**Natarajan,** p53:10 through p54:8; 'Transfer function' of applicant is equivalent to 'f(x)' of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings

of Spencer by introducing the concepts of 'bias values', 'summation of products', and transfer functions' as taught by Natarajan to have a bias module configured to provide a scalar bias value; a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

For the purpose of highlighting the basic components of a neural network.

Claim 7.

Spencer fails to particularly call for the transfer function comprises a non-linear transfer function.

Natarajan teaches the transfer function comprises a non-linear transfer function. (**Natarajan,** p53:10 through p54:8; 'Non-linear transfer function' of applicant is equivalent to 'Sigmoidal finction' of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by having the neural network result in a non-linear output as taught by Natarajan to have the transfer function comprises a non-linear transfer function.

For the purpose of taking advantage of a neural network property of handling non-linear problems with exceptional results.

Claim 8.

Spencer fails to particularly call for the transfer function comprises a tangent sigmoid function.

Natarajan teaches the transfer function comprises a tangent sigmoid function. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by employing a tangent sigmoid function as taught by Natarajan to have the transfer function comprises a tangent sigmoid function.

For the purpose of configuring the neurons to implement a hyperbolic tangent sigmoid function.

Claim 9.

Spencer fails to particularly call for the transfer function comprises at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

Natarajan teaches the transfer function comprises at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using the industrial standard Sigmoid function in the neural netrwork as taught by Natarajan to have the transfer function comprises at least one function selected from the group comprising a

sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

For the purpose of using a standard transfer function enables consistence comparison with other neural networks that employ a Sigmoid transfer functions.

Claims 10 and 25.

Spencer fails to particularly call for the at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

Natarajan teaches the at least one aeroelastic analysis result comprises a flutter frequency at a damping value. (**Natarajan,** p44 through p48; Natarajan illustrates frequency at a given damping value in Figure 2.14) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by illustrating the relationship between flutter frequency and damping value as taught by Natarajan to have the at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

For the purpose of determining the minimum flutter frequency using a given damping value.

Claims 13 and 27.

Spencer fails to particularly call for the at least one aeroelastic analysis result comprises a contour plot of store loadings.

Natarajan teaches the at least one aeroelastic analysis result comprises a contour plot of store loadings. (**Natarajan,** p46, Figures 2.13 and 2.14; 'Store loadings' of applicant is equivalent to a collection of data points of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by displaying all the store loadings onto a single plot as taught by Natarajan tohave the at least one aeroelastic analysis result comprises a contour plot of store loadings.

For the purpose of examining al the data from a single source.

Claim 16.

Spencer fails to particularly call for the weight comprises a weight less than a predetermined maximum weight.

Natarajan teaches the weight comprises a weight less than a predetermined maximum weight. (**Natarajan,** p21:13-16; 'Maximum weight' of applicant is equivalent to 'maximum pressure drag', of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by setting an upper limit for the weight as taught by Natarajan to have the weight comprises a weight less than a predetermined maximum weight.

For the purpose of not using weight values which will never be used.

Claim 23.

Spencer fails to particularly call for wherein applying the predetermined neural network transfer function comprises: multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

Natarajan teaches wherein applying the predetermined neural network transfer function comprises: multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter(**Nartarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing together the at least one weighted input parameter and a bias value to generate a summed value (**Natarajan,** p54 Figure 3.1, Input and weight go into biases 'b' and 'c'); and applying a neuron transfer function to the summed value. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by illustrating the basic components and algorithms of a neural network as taught by Natarajan to applying the predetermined neural network transfer function comprises: multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

For the purpose of demonstrating the consistence construction of this neural network with other neural networks.

Claim 29.

Spencer anticipates receiving a mass input (**Spencer,** p539:8-18); receiving a location of the mass on an aircraft structure. (**Spencer,** p539:35-41)

Spencer fails to particularly call for applying a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result and outputting the flutter result; multiplying the mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value.

Natarajan teaches applying a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result (**Natarajan,** p53-58; 'Aeroelastic analysis flutter result' of applicant is equivalent to 'applications such as flutter control' of Natarajan.) and outputting the flutter result. (**Natarajan,** p57:17-18; If there exists flutter control then there must be output for flutter results.) multiplying the mass input and location with a weight vector to produce weighted input parameters (**Natarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing together weighted input parameters and a bias value to generate a summed value. (**Natarajan,** p53:9; The summation sign implies 'summing together'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using a neural network for computing flutter analysis as taught by Natarajan to applying a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result and outputting the flutter result; multiplying the

mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value.

For the purpose of using the inherit advantage of a neural network to solve non-linear problems.

Claim Rejections - 35 USC § 103

7. Claims 11, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer as set forth above in view of Kawada (U. S. Patent 5784739, referred to as **Kawada**)

Claims 11, 24.

Spencer fails to particularly call for wherein the aeroelastic analysis result comprises a flutter speed at a damping value.

Kawada teaches wherein the aeroelastic analysis result comprises a flutter speed at a damping value. (**Kawada,** C5:5-15) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by illustrating the relationship between flutter speed and a damping value as taught by Kawada to have the aeroelastic analysis result comprises a flutter speed at a damping value.

For the purpose of determining at what speed flutter speed occurs at what damping value.

Claim Rejections - 35 USC § 103

8. Claims 12, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer as set forth above in view of Schnelz (U. S. Patent 6189830, referred to as **Schnelz**)

Claim 12.

Spencer fails to particularly call for the at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value.

Schnelz teaches the at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value. (**Schnelz,** C1:56-64; Schnelz illustrates an example of 'flutter speed', 'frequency' and 'damping'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by illustrating the relationship between flutter speed, flutter frequency and damping value as taught by Schnelz to have at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value.

For the purpose of determining at what speed will flutter frequency will occur in relationship to damping.

Conclusion

9. The prior art of record and not relied upon is considered pertinent to the applicant's disclosure.

-U. S. Patent Publication 20030185457: Campbell

-U. S. Patent Publication: Ishida

-U. S. Patent 6442535: Yifan

-U. S. Patent 6101270: Takahashi

-U. S. Patent 6185470: Pado

-U. S. Patent 6607161: Krysinski

-U. S. Statutory Invention Registration US H2057H: Veers

-U. S. Patent 6273680: Arnold

-U. S. Patent 6216063: Lind

-U. S. Patent 5890675: Lacabanne

-U. S. Patent 5887828: Appa

10. Claims 1-30 are rejected.

Correspondence Information

11. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3687. Any response to this office action should be mailed to:

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P.C.

Peter Coughlan

4/11/2006